

**Study Guide**

For use with pages 470–474

**GOAL** Compare and order real numbers.**VOCABULARY**

An **irrational number** is a number that cannot be written as a quotient of two integers. The decimal form of an irrational number neither terminates nor repeats.

The **real numbers** consist of all rational and irrational numbers.

**EXAMPLE 1** Classifying Real Numbers

Number	Decimal Form	Decimal Type	Type
a. $2\frac{3}{4}$	$2\frac{3}{4} = 2.75$	Terminating	Rational
b. $-\frac{6}{11}$	$-\frac{6}{11} = -0.545454\dots = -0.\overline{54}$	Repeating	Rational
c. $\sqrt{2}$	$\sqrt{2} = 1.41421356\dots$	Nonterminating, nonrepeating	Irrational

**Exercises for Example 1**

Tell whether the number is *rational* or *irrational*.

1.  $\frac{4}{9}$

2.  $-8$

3.  $-\sqrt{81}$

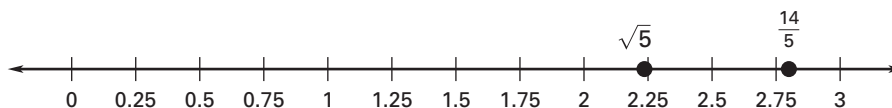
4.  $\sqrt{11}$

**EXAMPLE 2** Comparing Real Numbers

Copy and complete  $\frac{14}{5} \underline{\hspace{1cm}} \sqrt{5}$  using  $<$ ,  $>$ , or  $=$ .

**Solution**

Graph  $\frac{14}{5}$  and  $\sqrt{5}$  on a number line.



$\sqrt{5}$  is to the left of  $\frac{14}{5}$ .

**Answer:**  $\frac{14}{5} > \sqrt{5}$

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**EXAMPLE 3** Ordering Real Numbers

Use a number line to order the numbers  $-\sqrt{7}$ ,  $\frac{17}{5}$ ,  $-3.1$ , and  $\sqrt{6}$  from least to greatest.

**Solution**

Graph the numbers on a number line and read them from left to right.



**Answer:** From least to greatest, the numbers are  $-3.1$ ,  $-\sqrt{7}$ ,  $\sqrt{6}$ , and  $\frac{17}{5}$ .

**Exercises for Examples 2 and 3**

Copy and complete the statement using  $<$ ,  $>$ , or  $=$ .

5.  $\sqrt{11}$  ?  $\frac{11}{3}$

6.  $-9.3$  ?  $-\sqrt{82}$

7.  $-\frac{39}{9}$  ?  $-2\sqrt{5}$

8.  $3\sqrt{2}$  ?  $\sqrt{17}$

Use a number line to order the numbers from least to greatest.

9.  $5\sqrt{2}$ ,  $7.1$ ,  $\frac{32}{5}$ ,  $\sqrt{21}$

10.  $-2\sqrt{2}$ ,  $-2.3$ ,  $-\frac{13}{5}$ ,  $-\sqrt{7}$

**EXAMPLE 4** Using Irrational Numbers

A car in an accident leaves skid marks of 208 feet. Evaluate the expression  $3\sqrt{3\ell}$ , where  $\ell$  is the length of the skid marks in feet, to find the car's speed in miles per hour at the time the brakes were applied.

**Solution**

$$3\sqrt{3\ell} = 3\sqrt{3 \cdot 208} \quad \text{Substitute 208 for } \ell.$$

$$= 3\sqrt{624} \quad \text{Multiply.}$$

$$\approx 75 \quad \text{Approximate using a calculator.}$$

**Answer:** The car's speed was about 75 miles per hour.

**Exercises for Example 4**

Using the information in Example 4 and the given length of the skid marks, find the speed of the car at the time the brakes were applied. Round your answer to the nearest mile per hour.

11.  $\ell = 20$  ft

12.  $\ell = 200$  ft

13.  $\ell = 76$  ft

14.  $\ell = 156$  ft